# Effect of divertor closure on detachment threshold and pumping throughput in JT-60SA

- **Proponents and contact person:** G. Rubino (giulio.rubino@istp.cnr.it), L. Balbinot (luca.balbinot@dtt-project.it), D. Silvagni, I. Kudashev, E. Serre, G. Falchetto, G. Ciraolo, A. Murari, M. Gelfusa, A. Belpane

- **Scientific Background**
  - Divertor closure was proven to play a role in detachment and in pumping throughput in experiments. In JT-60SA modelling (G. Rubino et al.), the outer strike point vertical position was estimated to have a major impact on neutral pressure and detachment threshold in unseeded discharges only (Figures 1 and 2).
  - A multi-machine scaling law is being developed to link $n_{e,\,sep}$ to neutral pressure (D. Silvagni et al., Figure 3)

- **Objectives**
  - Verify and quantify pumping throughput and neutral pressure dependence on outer strike point location (divertor closure) -> **informative for W transition**
  - Access detachment onset conditions dependence on div. closure in unseeded and seeded (Ne/Ar) discharges **[DSOL-2]**
  - Evaluate the effect of divertor closure on enrichment level
  - Verify the scaling (Fig. 3) and integrate JT-60SA data to it

- **Methodology and measurements**
  - Key diag.: neutral press., Langmuir, infrared cameras, TS
  - Other req. diag.: Bolometry, VUV div, visible cameras…
  - Post proc. and analysis with SOLEDGE3X, SOLEDGE-HDG and SOLPS-ITER

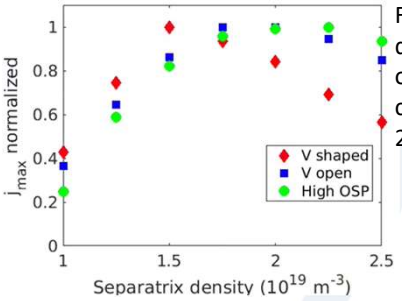


Fig. 1: in unseeded cases, lower density required for detachment onset in corner-corner configuration [Rubino et al., EPS 2025]

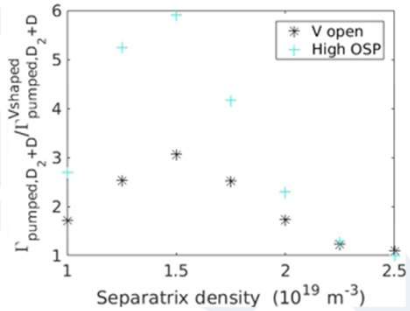


Fig 2: Pumping throughput is expected to be up to a factor 5 higher with higher OSP position

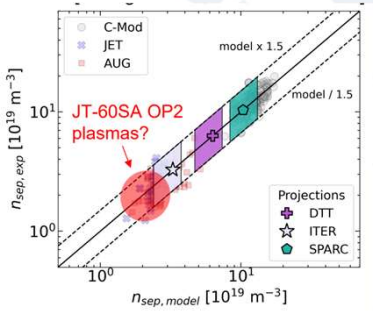


Fig 3: Scaling law and operational range prediction of JT-60SA and other machines [Silvagni et al., IAEA-FEC 2025]

## Discharge description: 8 (+8 for prep.)

Preferably **OP2 baseline** in **D** (H also accepted)
**Fueling/seeding steps** (0.5s) are preferred to ramps due to neutral transp. time.
L-mode preferred, H-mode also accepted

- **4** unseeded **fueling step-ramps** from attached to detached conditions, with corner-corner s.p. and with higher s.p. (about 8cm above); 2 current levels
- **4 seeding step-ramps** from attached to detached (2 with each s.p. location)

| # pulses | Bt | Ip | Seeding | Outer strike p. |
|---|---|---|---|---|
| 2 | 2.28 | 3.0 | No | 1 corner / 1 higher |
| 2 | 2.28 | 4.6 | No | 1 corner / 1 higher |
| 2 | 2.28 | 4.6 | Ne | 1 corner / 1 higher |
| 2 | 2.28 | 4.6 | Ar | 1 corner / 1 higher |